

SUPPORT FOR THE AMENDMENTS

The present amendment amends claims 17 and 26, and adds new claims 36-38.

Support for the amendment to claim 17 and newly added claims 36-38 is found at specification page 3, lines 15-17 and 25-29, page 6, lines 10-17, page 8, lines 4-7, page 12, lines 29-33, and page 13, lines 1-5, as well as Fig. 1 and 2.

It is believed that these amendments have not resulted in the introduction of new matter.

REMARKS

Claims 17-38 are currently pending in the present application. Claims 17 and 26 have been amended, and new claims 36-38 have been added, by the present amendment.

Applicants wish to extend their appreciation to Supervisory Examiner Caldarola and Examiner Singh for the helpful and courteous discussion held on June 24, 2008, with their undersigned Representative. During the meeting, the prior art rejections were discussed. The content of this discussion is believed to be reflected in the remarks set forth herein.

Applicants also wish to extend their appreciation to the Office for the indication on page 6 of the Official Action that claims 30-32 contain allowable subject matter.

The rejections under 35 U.S.C. § 103(a) of: (1) claims 17-26 and 33-35 as being obvious over Meyer (U.S. 2003/0181772); (2) claims 27 and 29 as being obvious over Meyer in view of Dorbon (U.S. Patent 6,137,023); and (3) claim 28 as being obvious over Meyer in view of Paludetto (U.S. Patent 5,563,299), are obviated by amendment, with respect to amended claim 17.

Applicants respectfully submit that Meyer (U.S. 2003/0181772) does not qualify as prior art under 35 U.S.C. §§ 102 or 103. The present application is a 35 U.S.C. § 371 National Stage patent application of International patent application PCT/EP03/07991, filed on July 22, 2003. Meyer has a publication date of September 25, 2003, and therefore does not qualify as prior art under 35 U.S.C. § 102(a) or (b). Meyer also does not qualify as prior art under 35 U.S.C. § 102(e)(1) since priority document WO 01/85656 was published in a non-English language (See e.g., MPEP § 706.02(f)(1), Example 5 and III. Flowcharts). However, it should be mentioned that although Meyer does not qualify as prior art under 35 U.S.C. §§ 102 or 103, Meyer could have been relied upon as the English language equivalent of WO 01/85656 and DE 10022465. Accordingly, the patentable distinction of the present invention over the disclosure of Meyer is discussed herein.

Amended claim 17 recites a continuous process for fractionating a C₄ fraction by extractive distillation using a selective solvent in an extractive distillation column having a dividing wall that extends in the longitudinal direction to an *uppermost point* of the extractive distillation column to form a first region, a second region and a lower combined column region, wherein the process comprises: taking off from the first region a top stream comprising *predominantly* one or more butanes; taking off from the second region a top stream comprising *predominantly* one or more butenes; and taking off from the lower combined column region a stream comprising one or more hydrocarbons from the C₄ fraction which are more soluble in the selective solvent than are the butanes and the butenes.

In contrast, Meyer describes a process for isolating 1,3-butadiene from a C₄ fraction by extractive distillation using a selective solvent in an extractive distillation column (EDK), which is equipped with a dividing wall (T) arranged in a longitudinal direction to thereby form an upper common column region (1), an inflow section (2a, 2b, 4), and an offtake section (3a, 3b, 5a, 5b), wherein the process involves taking off from the upper common column region (1) a single top stream comprising both butanes and butenes, and taking off from the offtake section a stream comprising 1,3-butadiene (See e.g., [0006], [0010], [0036], [0064], [0076], [0077], and Fig. 1).

Dorbon describes hydroisomerization of 1-butene to 2-butene (See e.g., column 2, line 29, column 3, lines 34-36, column 4, lines 13-16).

Paludetto describes a process for producing alkyl tert-butyl ethers comprising etherification of a C₄ hydrocarbon mixture consisting essentially of isobutene, linear butenes and butanes, separation of the alkyl tert-butyl ethers produced, and skeletal isomerization of recovered linear butenes to isobutene (See e.g., column 2, lines 38-59, column 3, lines 1-21 and 28-63).

As shown in Figures 1 and 2 of the present specification, the dividing wall (TW) extends in the longitudinal direction to an uppermost point of the extractive distillation column (EDK) in a manner such that a first region (A) and a second region (B) are formed. According to the claimed process, a top stream comprising predominantly one or more butanes is taken off from the first region (A) and a top stream comprising predominantly one or more butenes is taken off from the second region (B).

As shown in Figure 1 of Meyer, the dividing wall (T) does not entirely extend to the uppermost point of the extractive distillation column (EDK) and is thus arranged in a manner such that an upper common column region (1) region is formed. Accordingly, the dividing wall (TW) of the present invention is fundamentally different from the dividing wall (T) of Meyer. Unlike the claimed invention, the process of Meyer involves taking off from the upper common column region (1) only a single top stream comprising both butanes and butenes (See e.g., [0006], [0036]).

With such an arrangement of the dividing wall of Meyer, it is clearly impossible to separately take off a top stream comprising predominantly one or more butanes and a top stream comprising predominantly one or more butenes in a single distillation column, as is achieved in the process of the claimed invention. Therefore, a skilled artisan would not have had a reasonable expectation of success of separately taking off a top stream comprising predominantly one or more butanes and a top stream comprising predominantly one or more butenes, according to the process of the claimed invention, from the combined upper column region of the extractive distillation column of Meyer.

It should also be mentioned that Meyer further describes discharging the single top stream comprising both butanes and butenes (See e.g., [0063], [0076]), or sending the single top stream comprising both butanes and butenes to a thermally coupled distillation column (See e.g., [0078], [0079], Figures 2C, 2D, 3B, 3C and 3D).

While Dorbon describes hydroisomerization of 1-butene to 2-butene and Paludetto describes skeletal isomerization of linear butenes to isobutene, Dorbon and Paludetto fail to compensate for the previously mentioned deficiencies of Meyer. Neither Meyer, Dorbon, nor Paludetto, when considered alone or in combination, provide sufficient motivation and guidance to direct a skilled artisan to modify the extractive distillation column of Meyer to entirely extend the dividing wall to the uppermost end of the extractive distillation column to thereby form a first region for taking off a top stream comprising predominantly one or more butanes and a second region for taking off a top stream comprising predominantly one or more butenes.

Even if sufficient motivation and guidance is considered to have been provided by Meyer, Dorbon, and/or Paludetto, to modify the dividing wall of the extractive distillation column of Meyer to extend to the uppermost point of the extractive distillation column to thereby form a first region and a second region for separately taking off a top stream comprising predominantly one or more butanes and a top stream comprising predominantly one or more butenes, which is not the case, such a case of obviousness is rebutted by a showing of superior advantages and secondary considerations.

Applicants have discovered a process that involves taking off from an extractive distillation column separate and distinct streams comprising predominantly one or more butanes and one or more butenes, respectively. Accordingly, the simple and low-cost process of the claimed invention has the superior advantage of taking off separate and distinct streams comprising predominantly one or more butanes and one or more butenes, respectively, with a single extractive distillation column, without the need for employing complicated operations and expensive equipment, such as distillation columns thermally coupled to the extractive distillation column, as required by conventional processes, as described in Meyer.

The conventional process described in Meyer involves discharging the single top stream comprising both butanes and butenes presumably as waste, or sending the single top stream

comprising both butanes and butenes from the extractive distillation column to a thermally coupled distillation column for separation thereof, which according to the present specification requires about 20% more energy to operate than the claimed process (See e.g., page 16, lines 9-11).

Accordingly, there has been a long-felt need to reduce manufacturing costs during fractionating processes, while minimizing negative impacts on the environment. Based on conventional fractionating processes, which continue to employ complicated operations and expensive equipment while generating waste and consuming excessive amounts of energy, other skilled artisans have failed to discover a solution to this long-felt need. In contrast however, Applicants have discovered a simple, low-cost and environmentally friendly process that involves taking off from an extractive distillation column separate and distinct streams comprising predominantly one or more butanes and one or more butenes, respectively.

In conclusion, Applicants submit that the present application is now in condition for allowance and notification to this effect is earnestly solicited.

Respectfully submitted,

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